

from an increase in either the critical conditions or the number of injurable objects, under conditions in which the other variable and the period of time remain constant, cannot be expressed as a linear function of the number of units of the variable. The period of time is the only one of the three variable elements into which the exposure has been divided somewhat arbitrarily, with which the hazard varies directly, the other two variables remaining constant.

Even if the contribution of each of the variables were definitely known and if the hazard underlying the exposure could be expressed as a function of them, such an expression would be too involved for practical purposes. In actual practice the time element is eliminated by considering the aggregate injuries in blocks for selected unit periods of time—usually a year. This procedure brings together injuries of all degrees of severity and it becomes necessary to express the injury aggregate in terms of a common basis. The unit of measure used for this purpose is the economic unit, the dollar. The aggregate of injuries when expressed in the monetary standard of dollars is known as the *losses*.

A new variable, or set of variables, inherent in the *evaluation standard* used is introduced in the process of expressing the aggregate injuries in terms of dollars. This standard for evaluating injuries is the scale of remuneration adopted through a formal law as in compensation, or through custom and precedent as in the courts, or through community opinion as reflected in jury verdicts and private settlements. The effect of this new variable, the evaluation standard, is indicated by the difference in the losses obtained when the same or similar injuries to either human beings or inanimate objects are expressed in monetary units by the use of different evaluation standards.

PREMIUM BASES.

Insurance is the institution devised to transfer the losses arising out of the hazard from the few upon whom they chance to fall to the many exposed by paying the losses from funds called *premiums* which have been specially collected for this purpose. These premium funds are accumulated from charges called the *rate* collected per unit exposure. The exposure medium selected as the basis for the charge of the premium is known as the *premium basis*.

Obviously, the premiums collected are to be proportional to the hazard which is measured by the losses. The medium selected for measuring the exposure is the most important factor in making the premium collections in accordance with the probable loss incidence. The medium most desirable as a premium basis is the one possessing a combination of these two qualifications in the largest degree:

1. *Magnitude of Medium should vary with hazard.*

It is desirable to have for premium basis an exposure medium whose magnitude varies approximately directly with the hazard when this is measured by the losses. By using a medium which varies directly with the hazard, the total premium may be obtained by multiplying the exposure expressed in units of the premium basis by the rate.

2. *The Medium should be practical and preferably already in use.*

For measuring the exposure it is desirable to have a medium whose magnitude is readily ascertained and which is already used by the assured for other than insurance purposes. The use of a medium possessing these qualities promotes efficiency, as no additional records are necessary for measuring exposure, and enhances accuracy, as the various existing records may be used as a check.

When one considers the many diverse factors which enter into a hazard and the additional factors which enter into the evaluation of a hazard in terms of losses, one might expect that generally it would be impossible to find a medium whose magnitude varies directly with the losses. The factors underlying the losses, *critical conditions*, *injurables objects*, and *evaluation standard*, are studied as a preliminary to sorting hazards into somewhat homogeneous groups. Divisions made according to the kind of evaluation standard used, the type of injurable object covered, or the origin of critical conditions are known as *lines of insurance*. Divisions within these lines of insurance with regard to the frequency and severity of injuries or for convenience in practical procedure are known as *classifications*. These designations hold only in a very general way and have many exceptions. It is often difficult to distinguish between lines of insurance and classifications as used by different carriers or even by a single carrier.

In this discussion of premium bases it is proposed to review different media that might be used for measuring the exposure. For convenience in outlining the procedure the *injurible objects* will be divided into *human beings* and all other objects. At this time it is intended to consider only premium bases for insurance covering injuries to human beings. The coverages will be treated under four divisions which embrace the more important types. It is not intended to make this an exhaustive analysis including the special cases that may arise.

- I. Coverage for injuries to designated persons.
- II. Coverage to employers for industrial injuries to their employees.
- III. Coverage for liability for injuries to the general public.
- IV. Coverage for liability for professional acts.

I. COVERAGE FOR INJURIES TO DESIGNATED PERSONS.

1. Life Insurance.
2. Accident and Health Insurance.

In life, accident, and health insurance, coverage is given to individuals for specified injuries evaluated at specified amounts. These lines differ from the others of the four general divisions in that injuries are appraised at specified values which are prescribed in the contract. Within certain limits these specified values may be selected by the assured when making the contract.

1. LIFE INSURANCE.

In life insurance the critical conditions are those conditions external to the assured and also those bodily conditions within the assured which tend to place his life in jeopardy. The injurable object is the assured himself and the injury is the loss of his life. The measure of the injury in dollars by the evaluation standard is the amount named in the policy to be paid in case of death. The underlying assumption is that classifications, when refined with respect to age, occupation, sub-standard conditions, etc., are composed of individuals of equal essential hazard. The losses differ only because different amounts are written in the policies to be paid for the same injury, i.e. loss of life. The amount of insurance specified in the policy is obviously the exposure medium which varies directly with

the losses for the very reason that the losses are made a definite function of the amount insured by the specific provision in the policy. A medium consisting of the amount of insurance is quite practical and forms such an ideal premium basis that little thought is given to any other. In group life insurance the situation is not changed although through the use of weighted averages it becomes less obvious.

2. ACCIDENT AND HEALTH INSURANCE.

As in life insurance, the critical conditions of accident and health insurance are those conditions external to the assured and those internal which may produce injuries through accidents or ill health. The evaluation standard is more involved than in life insurance. The accident insurance contract generally specifies a maximum loss known as the principal sum, certain lesser losses which have a definite relativity to this maximum, and fixed weekly benefits. In health insurance the losses are evaluated through the weekly benefits written into the contract. The classifications, through sufficient subdivisions according to age, occupation, and other conditions that may affect the hazard, are assumed to be composed of individuals of equal essential hazard. Equivalent injuries sustained differ when evaluated as losses only through the variation in the principal sum and the weekly benefits because, by the terms of the policy, they are definitely related to these items. The principal sum and weekly benefits form ideal premium bases as they are quite practical and vary directly with the losses.

II. COVERAGE TO EMPLOYERS FOR INDUSTRIAL INJURIES TO THEIR EMPLOYEES.

1. Workmen's Compensation Insurance.
2. Employers' Liability Insurance.
3. Workmen's Collective Insurance.

Of the variables underlying the hazard of this group of coverages the *critical conditions* and the *injurable human beings* are substantially the same. The inherent injuries are the same under each of

these lines. The difference in the losses, which is due to a change in the *evaluation standard* used, arises out of these sources:

1. In Compensation a wider range of injuries is covered than in Employers' Liability. It does not necessarily follow, however, that the losses are larger under Compensation. In Workmen's Collective the extent of the liability assumed is stated in the contract.
2. The severity of an injury is expressed in monetary units by using different evaluation standards. In Compensation the standard is prescribed in the law. In Employers' Liability it consists in direct settlement mutually acceptable or in a jury verdict under court procedure. In Workmen's Collective the standard is specified in the contract.

Several premium bases have been considered and discussed in different degrees for these lines of insurance. As possible media for use in measuring exposure, these may be considered:

1. Payroll.
2. Restricted Payroll.
3. Man-Year.
4. Value of Product.

1. Payroll. Within the Compensation classifications the total injuries presumably vary directly with the time exposure. The indemnity cost of each injury of given severity varies with the rate of weekly compensation, which depends on the weekly wages. The indemnity losses vary as the product of the time and the weekly wages which product is represented by the payroll. Payroll as a medium does not respond fully to variation in losses to the extent that the losses are legally restricted by the maximum weekly payments and by the maximum amount paid on any case. If there were no limitation on weekly payments or on the maximum cost of a case then payroll would vary directly with the indemnity losses and from this viewpoint form an ideal medium for measuring exposures. Under the earlier Compensation laws these maximum limits were rather low and had an appreciable effect on the losses. Since then the limits have been raised

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